

Telecommunications Study:
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III. MARKET STRATEGY

A. Modes And Cost of Entry

1. Start-up Paging Service:

ARTHUR D. LITTLE, INC., estimated the initial investment of \$160,000 to \$260,000 for a relatively modest paging system of a single frequency with six transmitting tower sites, depending on the radio frequency used. The initial investment could also be significantly reduced by renting space on existing towers.

Service for a very small geographic area would probably have capital costs of about \$40,000.

Initial investment also depends on whether subscriber equipment is Customer Owned and Maintained (COAM) or leased. A service operator may use leasing arrangements with an equipment manufacturer or leasing company to further reduce initial investment.

Start-up of a service presumes that a frequency will be available to the operator. Fees include a \$35 license fee to the FCC plus a \$185 frequency coordination fee to the National Association of Business Educational Radio (NABER) per transmitter.

A critical hidden cost of starting up a new paging operation is the intensive marketing requirement to gain subscribers in a highly competitive environment or in an area where there is little perceived or real need for paging. Arthur D. Little's research shows that about 50% of all new subscribers to a system sign up because of referrals from existing subscribers.

2. Acquisition of existing Paging Operation:

The paging service operation business has been consolidating in large and medium sized markets. A number of publicly announced transaction prices for acquisitions have been established on a per-subscriber basis and approached \$1,000 per subscriber in 1989.

For either mode of entry, once a company reaches the breakeven point, it is not uncommon for operating profit and cash flow margins to reach between 25%-60% of sales.

Telecommunications Study:
MBE Opportunities

The advantages of acquisition include:

- An established paging system which saves licensing and construction time
- An existing subscriber base to build on
- B. Timing

No important issues of timing exist for this segment.

C. Critical Factors to Success

1. Must be able to obtain suitable paging frequency in geographic market.
2. Must be able to identify geographic market or business market segment not served or under-penetrated.
3. Must be able to add capacity to sustain growth.

IV. OPPORTUNITIES FOR MBE'S

- Start-up or acquisition of a paging service in rural areas where frequencies are normally abundant and the market is unserved.
- Start-up or acquisition of a paging service in small to mid-sized markets where some frequencies are still available.
- Resell or act as an agent for established operators and sell to specific market segments.

Although no formal documentation is available, another possible paging market opportunity exists for MBE owners of FM stations. Using their subcarrier frequencies, these FM station owners could make an additional capital investment of less than \$40,000 to \$50,000 for a digital encoding device to provide paging services in rural areas and/or small geographic areas. This type of service could be successful in rural areas, but would not be able to compete in the mid-sized to large markets with the service provided by the large paging carriers.

Telecommunications Study:
MBE Opportunities

MARKET SEGMENT ANALYSIS

PERSONAL COMMUNICATIONS NETWORKS

I. MARKET DEFINITION

A Personal Communications Network (PCN) is a type of portable two-way cellular technology that frees individuals from the constraints of traditional telephone service. Leading the forefront in this technology is the United Kingdom. The capabilities of PCN fall somewhere between that of CT-2 (advance digital cordless telephones) and cellular telephone. PCN is a digital micro-cellular system that operates at higher frequencies (1.7 to 2.3 GHz) allowing lower power and lower cost telephones than conventional cellular technology. PCN is being positioned as a mass-market technology where the cost of a light-weight hand-held unit will be as low as \$300.

Two cordless phone technologies are being tested in the U.S. One called Cordless Phone 2 (CT 2) is a low power service that functions in much the same way as the public pay phone network with the exception that the user carries the phone with him and makes calls by getting in range of a transmitter. The other technology, PCN, operates like a digital cellular service, but uses cells with a radius of 600 feet compared to the 2-mile radius of traditional cellular telephone.

Full geographic coverage will be essential to the success of PCN. Additionally, PCN will have to be highly competitive with terrestrial-based call rates - no more than 15 to 20 percent higher.

II. MARKET ENVIRONMENT

A. Current Market Status

PCNs are intended to provide the infrastructure to support a mass market for wireless, two-way, low-power, light-weight and inexpensive pocket radio telephones. The key to PCN is its densely-packed, small radio microcells operating at high frequencies and lower power levels than cellular. Because a caller would never be far away from one of the microcells, PCN telephones will not need much power and can be smaller.

PCN's capabilities lie somewhere between those of CT-2 (cordless telephone 2) and cellular telephone. For this reason, PCN is being

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MBE Opportunities

positioned as a low-cost cellular alternative aimed at consumers in pedestrian or fixed location situations as opposed to car-borne situations. The main drivers are:

1. Growth in demand and interest in wireless communications as a productivity and convenience tool
2. The relatively high cost of cellular service
3. Coverage and capacity constraints of cellular service
4. The added convenience of having only one telephone number that can be accessed/used from any location including home, office, car, or public area.

Cordless telephones are not new to the U.S. market. They have been the backyard/pool telephone for 10 years. However, networks supporting the use of these devices for urban and wide areas is a new phenomenon fostered in the United Kingdom.

The FCC has issued a Notice of Inquiry soliciting general information, but has not issued any rules. Of major concern, is determining the portion of the spectrum to allocate to this product. Experimental licenses have been granted (see section E), but these are using existing frequencies.

B. Sizing

Prices for the wallet-size handsets are likely to be in the \$300 range, but should fall to \$50 by the year 2000. U.S. revenues (handset and usage fees) for CT 2 type cordless phones could exceed \$1.2 billion by the year 2000. The mix of personal communicator products will change significantly over the next ten years. Following are the overall revenues for Personal Communications Network services and portable communicator products for 1988-1995. Source is Gartner Group.

Table 4
Revenue Projections for PCN Products and Services

	<u>Worldwide</u>	<u>United States</u>
1990	\$89M	---
1991	\$116M	\$5M
1995	\$584M	\$95M

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MBE Opportunities

C. Constraints

1. Licensing

Several issues will have to be resolved before PCN service can be licensed in the U.S.

- a. **Licensing of the 2 GHz spectrum:** This is a political issue in which there are competing commercial and government interests already using this spectrum. The spectrum in the U.S. is fully licensed and the political process to gain approval for licensing PCN and other spectrum-based technologies is time consuming and has put the U.S. behind Europe. In Europe, there is available spectrum and much more flexibility in developing new wireless communications technologies.
- b. **Procedures for licensing:** Procedures have not yet been decided but several means of allocating spectrum will be considered including comparative hearing, by auction or by lottery.
- c. **Who will be allowed to compete for licenses?** If current cellular and phone system operators are allowed to compete, they could position themselves to effectively control the way in which PCN evolves and will be deployed. Specifically, if they view PCN as a competitive threat, they can effectively neutralize its impact on their other lines of business.

2. Standards

PCN American will be using CDMA (Code Division Multiple Access) which will make it a distinct technology from digital cellular which will be employing TDMA (Time Division Multiple Access) techniques. CDMA encodes voice or data and transmits it, but instead of going over one channel as in TDMA, each signal is encrypted and transmitted across a broad spread of spectrum. Other versions of PCN-type service are being carried out by the cellular operators which will be adapting cellular technology to PCN. A lack of standards may further delay the delivery of competitive PCN services to the marketplace. Cable companies are already positioning themselves to provide PCN.

D. Geographic/International Issues

In the UK and Europe, PCN is being touted as the direct competitor to and replacement of cellular, except perhaps in non-metro car-

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MBE Opportunities

borne situations. In the U.S. and Canada, PCN is not intended as a replacement for cellular. It has neither the range nor wide geographic coverage capability of cellular in the wider dispersed geographies and populations of both countries. It may, however, challenge cellular in high density metro areas or other small specialized market segments, such as campus-like environments.

As with CT-2, the British have taken the lead in PCN; the Department of Industry and Trade awarded three licenses in late 1989. PCN Licensees in Britain and percent of ownership by various companies include:

Mercury Personal Communications Networks

Cable and Wireless	60%
Motorola	20%
Telefonica	10%
Unallocated	10%

Unitel

STC	30%
US West	30%
Thorn EMI	25%
DBP	15%

STET with 15% pulled out

British Aerospace (Space Communications)

BAE	35%
Pacific Telesis	20%
Millicom	14%
Sony	4%
Unallocated	17%

Existing cellular operators Vodaphone (owned by Racal) and Cell Net (60% British Telecom and 40% Securior) could also provide PCN, but only on their existing 900 MHz frequencies.

E. Players/Competition

There are several technologies competing with PCN. Below are the disadvantages relative to PCN of each:

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Technology

Competitive Disadvantage

Cellular

Car borne user
Poor quality coverage
Restricted capacity
High portable handset cost
High service cost

Digital European Cordless
Telephone (DECT)
and CT-2

Access to fixed network
Localized range
Continuous coverage impractical
One-way communications (CT-2)

Local Telephone
Exchange

Access from fixed handset; not mobile
Multiple phones, multiple numbers

Paging

Access to fixed network
One-way communication

The relative advantages of PCN are as follows:

- Efficient use of bandwidth
- Capacity
- Extent of coverage
- Lower service (allegedly) and handset cost
- Two-way, non-location restricted communications
- Single phone, single number

The implementation of PCNs and the degree to which they will be competitive with cellular telephone will vary from market to market, both at a macro level (regional and country) level and micro (metro) level. A number of PCN, cordless phone and personal telephone service (PTS) trials have been approved by the FCC. These trials are designed to determine consumer interest in these types of services and verify that they can be implemented without interfering with other communications systems, particularly those in use by fire and police departments. Following is a list of the experimental licenses that have been awarded (trials).

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MBE Opportunities

Table 5
PCN Experimental Licenses

<u>Ventures</u>	<u>Test Coverage Area</u>
Cellular 21 Inc.	Ithaca, NY
Cellular General Inc.	Deerfield Beach, FL
Matrix Personal Communications Inc.	Chicago
American Personal Communic. Inc. (APC)	Washington, DC
PCN America Inc.	Orlando, Houston
Litel Telecommunications	Columbus, OH
Motorola	Chicago, Atlanta
BellSouth & Sony	GA
Graphic Scanning Corp.	Chicago, Detroit, White Plains, NY
Timex	Middlebury, CT Headquarters campus

Two cable television companies, Cox Enterprises and Cablevision, have recognized that it may be more profitable to promote PCNs communication networks, than to fight them. They intend to combine PCN with their existing cable plants. Each company has requested experimental licenses for cities in their cable TV coverage area.

Bell Atlantic and Omnipoint Data Co. of Colorado Springs, CO are jointly developing a spread spectrum based PCN. The venture has decided to use spectrum in the industry, science and medical (ISM) area, specifically the 902-928 MHz band and the 2.4-2.8 GHz and 5.725-5.850 GHz bands which do not require special spectrum allocation. The Omnipoint developed is highly secure with CDMA and can support from 40 to 50 users within a radius of 150 feet.

Cylink Corp. subsidiary, Digital Spread Spectrum Technologies of Sunnyvale, CA, filed with the FCC for two PCN experimental licenses. One license is for tests in the 1850-1990 MHz band and the other in three diverse bands - 900 MHz, 2.4 GHz and 5.7 GHz - October 1990.

**Telecommunications Study:
MBE Opportunities**

In October, 1990, Pacific Telesis Group filed for an FCC experimental license to study PCN. It stated that it wanted to study how wireless services "interact with the evolving intelligent local exchange network and how well they meet consumer needs." Others, including NYNEX, have begun filing for experimental tests and operations. Unlike many PCN experimental license requests which are spectrum specific, Pacific Telesis requests the right to explore a large range of spectrum, from 600 MHz to 2.5 GHz. It appears from the filing that the primary objective of the test is technical evaluation not the evaluation of market potential.

F. Sources of Information

Gartner Group Consulting, primary research and extracts from the Local Area Communications Research Service.

III. MARKET STRATEGY

A. Modes of Entry

PCN is in a formative stage in the United States. This provides an opportunity for a company to enter the market. Opportunities exist:

- To obtain an FCC license as a service provider; possibly concentrating in a local, small geographic area.
- To provide service and support to local users for installation and maintenance.
- To be a distributor of PCN handsets and software.

B. Timing Considerations

The time lag involved in the political process for spectrum allocation jeopardizes the delivery of PCN in the U.S. According to optimistic estimates, the availability of PCN (mid-to-late 1990's) will coincide with digital cellular which will support six times current capacity. The capabilities of digital cellular could displace PCN. Furthermore, as long as cellular operators develop PCN within the allocated cellular spectrum, they are not constrained by the regulatory process. Therefore, they are in a position to develop and deliver PCN-type service more rapidly than Millicom or any other such company.

If PCN can be developed in the 1992-1994 time frame, it can take advantage of the de-stabilization of the cellular market during its analog-to-digital transition. During this time, dual-mode phones

Telecommunications Study:
MBE Opportunities

will be bulkier and more costly than current cellular phones are today. Cost of services may be more, or at least, no less expensive. This will enable PCN to maximize its leverage using its competitive advantages: low cost service and small, low cost handsets.

The following are strategic planning assumptions with regard to the deployment of PCN over the next five-year planning period:

- PCN, as currently envisioned, will establish itself first in Europe and compete with cellular.
- PCN capabilities will evolve out of digital cellular technology.
- The world market is going to remain fragmented for the second wireless generation.

C. Cost of Entry

Sufficient financial resources will be required to build and operate a PCN network and properly manage it in order to deliver cost effective service. For PCN to be effective could require costs similar to deployment of the public telephone system. The level of such commitment is unclear and the recession will further delay deployment.

D. Critical Factors for Success

PCN advocates envision nationwide service incorporating cellular telephone functionality such as cell-to-cell hand off, terrestrial quality voice service, data service, and both call in and call out capability. However, Gartner Group believes the U.S. cellular telephone industry is well entrenched and wide spread. That coupled with its migration to digital service taking place in the same time frame that PCN type systems first begin installation in Europe make it unlikely to displace cellular in the U.S.

IV. OPPORTUNITIES FOR MBES

The market for PCN is very new and unformed. What exists today is a concept using existing technology but without a true understanding of customer requirements or demand. However, based on the incredible growth of the cellular industry in the 1980s, there are strong indications that personal communications will become very important in the future. PCN bears watching by MBES interested in this type of technology. As listed under "Modes of Entry", MBES should consider any of those opportunities as appropriate.

Telecommunications Study:
MBE Opportunities

MARKET SEGMENT ANALYSIS

MESSAGING: VOICE PROCESSING AND ELECTRONIC MAIL

I. MARKET DEFINITION

The messaging market is defined as the automated handling of voice and electronic messages which includes voice mail, call processing, voice response, voice recognition, voice synthesis/voice response, and electronic mail.

Voice messaging is the capability of allowing a calling party to leave a detailed message for the called party when they are busy or away from their telephone. In business, this function can be provided by a PBX system, a stand-alone computer voice mail system, a central office-based feature offered by a local telephone company or by a service bureau. The called party then has the ability to save the call or respond to the calling party.

Additionally voice processing systems provide users with the ability to interact with a computer and telecommunications systems. The caller, normally using a touch-tone phone, can inquire against a data base and receive real-time information (audiotext). The computer provides voice-simulated instructions and information. Some systems with the latest technology, provide for voice recognition in place of the touch-tone phone.

Most voice messaging systems are sold as free standing units with their own hardware, software, and disks. Electronic mail systems are incorporated as a software/network function within a network environment. Many PBX manufacturers have begun offering integral messaging capabilities for their systems. The integration of a messaging and voice processing application with a PBX, with a LAN, and with part of a LAN are important developments that have contributed to market growth.

An electronic mail system provides businesses with the capability of transmitting data, text, or documents between terminals, workstations or personal computers. Electronic mail networks are established to interconnect these devices. These systems can be structured within a business establishment or between locations of a business. Service bureaus have also developed applications for users to leave and receive messages from other participants and these are generally described as store-and-forward systems.

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MBE Opportunities

Messaging takes many forms in both voice and electronic text and imaging. The application of messaging has been further segmented by four application categories:

- Messaging
- Call Processing
- Information Distribution
- Transactional Processing

Table 6 shows the use of systems and technology within these applications:

Table 6
Use of Systems and Technology Within
Messaging Applications

APPLICATIONS				
	Messaging	Call Processing	Information Distribution	Transactional Processing
Voice	Voice Mail	ACD Automated Attendant	Audiotext Voice Synthesis	Voice Response Voice Recognition
Text	Electronic Mail		Videotext	

II. MARKET ENVIRONMENT

A. Current Status of the Market

Messaging technology first appeared in the telecommunications arena in the late 1970's. It was to be an extension of the voice answering machines used by consumers and businesses. The airline industry was the first to implement call processing as it was a major requirement in their reservation networks. By 1985, many PBX and Centrex users began adding voice mail and voice messaging features to their systems. Companies, such as Octel and VMX, developed stand-alone systems that provided dedicated integrated capabilities.

Other key developments include the introduction of customized applications such as audiotext and the increasing acceptance of

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voice messaging technology by smaller companies. Enhancements such as networking (connecting different types of machines), and sophisticated integration methods (combining voice mail and call processing) appeared in 1986 and 1987. It is anticipated that the market will continue to move beyond simple voice messaging applications to the extensive use of applications such as integrated voice response (IVR), speech-to-text, and speech recognition.

At the time that voice messaging was maturing, the market was introduced to electronic mail functionality. The original concept allowed terminal and personal computer users to exchange messages electronically. Businesses and public sector organizations have developed an entire set of networks for the purpose of exchanging electronic messages. These systems include the capability of broadcasting messages, providing immediate delivery to a computer or facsimile machine utilizing store-and-forward capability, and the ability to send messages to or receive messages from the network from off-network locations. Electronic mail is one of the first applications that was intended to reduce the flow of paper and documents in the office.

As in all areas of communications technology, the trend in messaging is towards increased integration and increased application sophistication. This trend will strengthen with the growth of intelligent networking as telephone companies convert their facilities to accommodate advanced signaling systems and enhanced storage and addressing systems. An example of an integrated application is the use of voice processing as a front-end for facsimile delivery. A more futuristic application may use speech-to-text or text-to-speech technologies for recording electronic mail messages on a voice mail system. Integrated Systems Digital Networks (ISDN) is a network technology that will enhance the ability to integrate multiple transmission media in a single application and onto a single network gateway.

Voice messaging and electronic mail systems were once a luxury only large companies could afford. Acceptance of the technology and integration of functionality has caused costs to fall and usage among all corporations, large to small, to rise. At the same time, the user has identified a multitude of needs and applications that take advantage of the technology and functionality of these messaging systems.

Products and opportunities in the messaging market can be broken down into: PC-based products, stand-alone systems, and service bureau applications.

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1. The PC-based system includes an add-on board that accommodates from one to eight ports for incoming telephone lines and messaging software. Adding voice messaging and electronic mail capabilities to a PC is the same as adding other communications products.
2. Stand-alone systems are dedicated to voice messaging or electronic mail tasks. The system is specifically designed for the application; hardware and software being optimized for performance. There is an on-going debate over PC-based and stand-alone systems. Traditional trade-offs when choosing between the two systems have been system capacity (the maximum number of phones, terminals, users a system can accommodate) and processing power. Both types of systems are comparable for basic voice mail and electronic mail applications. Yet, stand-alone systems which have dedicated processors for each application, are better suited for handling integrated voice processing and electronic mail applications.
3. A third mechanism of providing voice mail and electronic mail is through a service bureau or central telephone company service. In both cases, the user does not have an in-house system to control, administer and operate. The concept is similar to time sharing. The service provides and delivers functionality and administers the application for the user. The result is a smaller initial capital for the user, but a larger monthly service fee.

The service bureau is analogous to a rental mailbox service. For a monthly fee, plus a charge per unit, the messaging application is available with most of the basic features of a stand-alone system without the initial capital investment. Service bureaus, leveraging cost across multiple users, can more readily opt for state-of-the-art technology.

New voice processing features are taking the place of older, standard features, such as call forwarding. Most new voice processing features involve some level of interactive voice response (IVR) technologies through which callers can interact with a computerized voice message using the telephone's keypad. When combined with PBX or Centrex, and in some cases synthesized speech, callers can gain access not only to people and departments but also to computers, electronic mail, facsimile, and other text-based information media.

While the voice messaging market is being driven towards interactive voice/data/text systems, the majority of the current opportunities are in:

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- Automatic call handling, voice mail
- Voice response applications
- Interactive voice response applications

The two most familiar applications of voice messaging are call answering and voice mail. With call answering, the caller is routed to a voice mailbox whenever the dialed line is busy or unanswered. With voice mail, the system is independent of the subscriber's telephone facilities. The caller directly enters the voice mail system via an outside line.

As technology has grown and companies have become accustomed to voice messaging, more applications have evolved. These applications are considered an integral part of the business and can affect business productivity, individual performance, client and customer relationships. Telephone call centers and company voice mail are the two major applications for voice messaging technology.

Telephone call centers have proven to be a powerful strategic and competitive tool in customer service. The success of any call center operation depends on achieving a high level of customer handling quality and satisfaction, while still controlling costs. It is increasingly apparent that voice technology processing is playing a larger role in helping centers meet these goals.

There are two different approaches for the use of this technology in today's call centers. The first one uses the technology to assist the call center representatives (reservation agent, customer service representative, telemarketing) in their call handling duties. The earliest of these was the use of the recorded "wait" announcement in automatic call distributors (ACDs). This feature has recently advanced to include an estimate of wait time. Today, automated attendant machines are commonly used to provide the capability for faster call handling.

Company voice mail provides an alternative to the busy signals and no answers. Voice mail works on a one-to-one or one-to-many basis. Voice mail provides the user with an option for callers to leave a "call back message" when wait time becomes too long. Voice mail can be used in conjunction with an ACD, however, it will achieve limited success, as customers require live response.

The standard requirement for voice mail is for vendors, clients, and co-workers to leave messages. The called party is then assured that no message or call is missed. Organizations that consider voice mail systems must satisfy a group of end users. The system

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must have some flexibility so that each user can tailor it to his/her likes and dislikes. Voice mail is well established and fairly accepted in the corporate office environment. The business community also uses voice mail functionality in the cellular/mobile area, requiring the same functionality as the office-stationed telephone.

Some voice messaging systems have added a voice response capability. The voice response function involves providing automatic caller identification for synchronized presentation of the caller's voice and a screen of the customer's information to a called party. The voice response capability meets the customer need to handle simple caller inquiries without customer service representative, intervention. The voice responses unit interfaces with a computer data base, interprets a touch-tone inquiry, accesses the data, and then translates the data into voice response to the calling party. Some typical voice response applications are:

- Catalog orders
- Checking/savings account inquiry
- Credit card authorization
- College registration
- Employee benefits
- Insurance policy inquiry
- Inventory update
- Price information
- Sport scores
- Stock prices
- Transportation schedules

Interactive Voice Response (IVR) is the next level of system sophistication in solving a total transaction application. The system not only provides status information, but then provides the caller with additional options to complete a transaction, update a data file, or place an order. Each of the above options can be expanded to incorporate interactive functionality. Because interactive voice response allows users to communicate with computers using a telephone, it expands the market opportunity and level of sophistication to any business establishment or home with a touch-tone telephone.

Corporations have identified enterprise-wide electronic mail (E-mail) as the top requirement for office applications over the next 2 to 3 years. Since E-mail is the most visible of networking applications, its prominence indicates user's connectivity requirements are evolving from the department level to the corporate level. E-mail has lost its traditional association as

Telecommunications Study:
MBE Opportunities

an alternative to conventional mail service and has become a complete new way of sharing documents, graphics and applications. The media used for E-mail is terminal-to-terminal; this can be a desk top computer or workstation communication to another desktop device either over a corporate LAN, using a telephone company network, or via a service bureau.

Increasingly, E-mail is hailed as an important "enabling technology" for office communications. By combining electronic messaging systems with other applications, information workers obtain tools to disseminate information for comment quickly, coordinate meetings and schedulers, hold meetings on-line electronically, and design applications that use messaging features to automate office processes.

As E-mail becomes increasingly integrated with a host of other office automation tools, it becomes easier and more cost effective to add value to information quickly and route it in any form desired. In organizations with a strategic vision for managing information resources, E-mail can become a platform for swift, value-added information processing involving many individuals.

E-mail is increasingly seen as a tool for enhancing productivity and as platform for further application development. The demand for E-mail varies widely, depending largely on the existing computing, communications, and applications environment of the user. In the market for E-mail for large platforms, the choices are limited. The resources required for a third-party vendor to develop E-mail software are considerable. E-mail is the cornerstone of integrated software solutions. The market for E-mail software is booming. The PC-LAN electronic mail market is only about three years old. In the market for LAN-based E-mail; there are more platform choices and more product choices. The major choices here tend to revolve around features, reliability, support, wide-area connectivity and price.

Today's market consists of a variety of electronic mail software, hardware and services with a wide range of features. Overall, the E-mail market is relatively small, but the products included in the market are very diverse, creating niches for a large number of vendors (and new market entrants) to do well inside one or more of the available niches. The firms that specialize in E-mail tend to be very small and tightly focussed in their markets.

Market requirements, and user requirements are the areas that drive new business opportunities. In the voice processing area most users are looking for the following types of support, primarily in developing, implementing and managing their systems:

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MBE Opportunities

- System designs; what features and configurations are required.
- Establishing a system acquisition and implementation plan.
- Training users on the effective application of the voice processing system.
- Incorporating voice processing capability into a marketing program.
- Monitoring the utilization of the system; is the user optimizing the use of the system, has productivity and performance improved.

In a similar fashion, corporations have identified a set of issues they need to address as they investigate Electronic Mail systems.

- PC Integration; developing an E-mail system that utilizes the existing personal computer system.
- Enterprise networking; ensuring that the corporate network is correctly designed to handle the E-mail application.
- Multivendor-connectivity; most corporations have developed office systems and work stations from more than one manufacturer. Users need support to tie these diverse systems together.
- LAN architecture; for internal systems, LANs, are the most appropriate means of connection. The user will require assistance in developing a LAN architecture that meets interconnection, storage, retrieval, scheduling, management, and bandwidth requirements.

B. Sizing

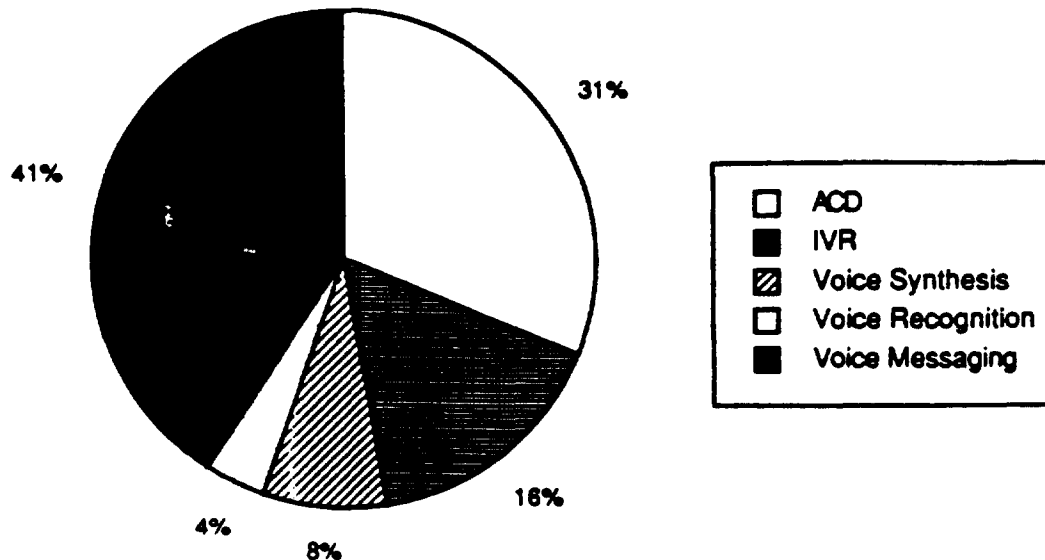
1. Voice Processing

The voice processing market will have the highest growth rate of any segment in the telecommunications market. The voice processing market was \$1.57 billion in 1990. The revenues of the various segments of this market are shown below.

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MBE Opportunities

Figure 3

1990 Voice Processing Market (\$1.57 billion)

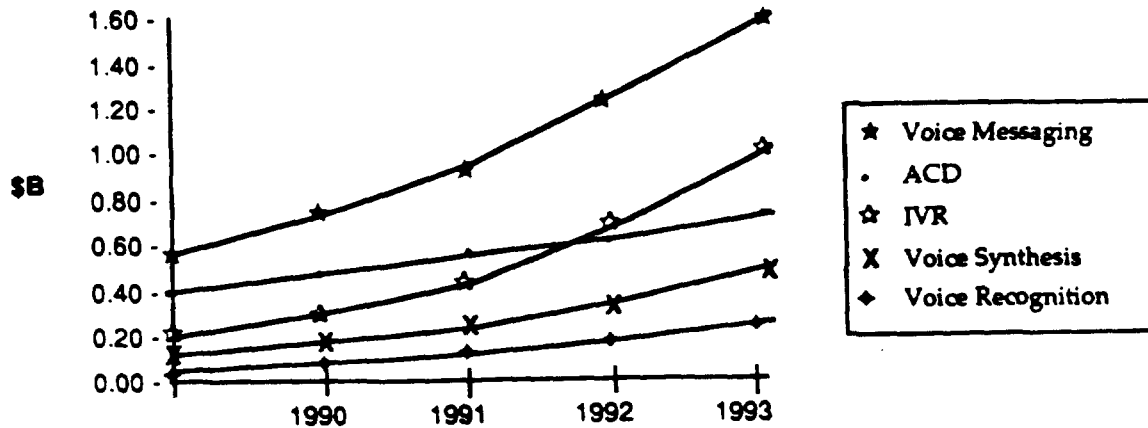


Most of the voice processing market growth and success can be attributed to the (almost) universal availability of touch tone phones. Judge Greene's decision to lift the restriction of voice mail and electronic mail businesses from the local Bell telephone companies in March, 1988 legitimized and expanded the voice processing market even further.

Overall, the voice processing product market is projected to grow to over \$4 billion by 1993; including automatic call distributors. The product areas that will undergo the greatest growth are the voice messaging and interactive voice response systems. The following chart shows the growth projections to 1993.

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Figure 4
Voice Processing Growth (1989-1993)



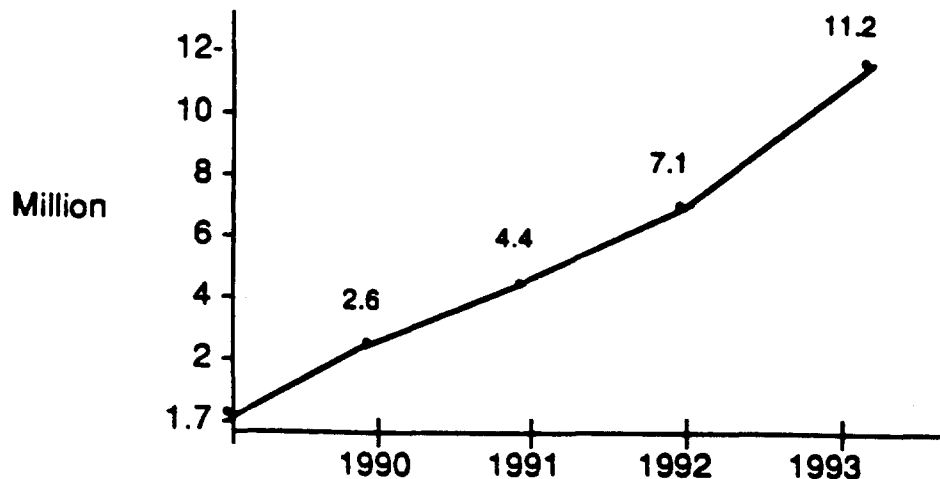
Source Gartner Group

2. Electronic Mail

The Electronic Mail market is poised for explosive growth. The size of the Electronic Mail market is measured by the number of active mailboxes there are on a network. Any network with two electronic mailboxes constitutes an electronic mail system. In 1989, there were approximately 1.7 million mailboxes interconnected via electronic mail networks. This figure is projected to grow to 11.2 million by 1993. The following chart shows the annual base of installed mailboxes (including stand-alone systems, LANs and service bureaus).

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MBE Opportunities

Figure 5
Installed E-Mailboxes (U.S.)



Source Gartner Group

C. Constraints

Regulatory considerations and standards are the two largest issues that could impact the growth and user acceptance within the voice processing and electronic mail market.

1. Regulatory

With the lifting of many of the pertinent regulatory restrictions, the Regional Bell Holding Companies can be a major force in the voice messaging and electronic mail market. Entry of the RBOCs has legitimized the market and expanded it. A residential market is best served by the local telephone company. As the RBOCs start providing these services, they will become major purchasers of voice processing and messaging hardware and software.

The motivation for the RBOCs to offer voice mail capability is extremely high. Thirty percent of all calls that are placed are not completed. With the ability to provide voice messaging, all calls have the potential of being completed. Network traffic will also be increased as each voice mail message generates 2 to 3 additional calls.

2. Standards

Interface (interconnectivity) standards and protocols are the major issue related to mail and message systems. Progress has been made

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MBE Opportunities

in defining common interfaces for voice messaging systems and for electronic mail.

The Audio Messaging Interchange Specifications (AMIS) group defined methods for systems to exchange voice messages, together with control and status information. In addition, the Voice Messaging User Interface Forum (VMUIF) defined a framework for common user interface for core features for voice messaging services.

Customers of voice messaging systems do not want to be locked into one vendor to supply systems that meet their needs. If an organization requires voice or electronic mail at more than one location involving communications between the locations, that corporation must buy all systems from the same vendor. This is because each vendor has its own proprietary network protocol, making it impossible to mix vendor equipment.

The success of voice and electronic mail is highly dependent on being able to send or receive messages to and from the people with whom communication is needed. The messaging industry needs both analog and digital networking protocols because of the diversity in needs among customers.

The digital protocol was designed to provide high functionality; secure, robust, high quality; and high volume inter-vendor networking. It is based on the CCITT X.400 series of recommendations for message handling systems. The level of the messaging standardization being attempted today is extremely limited. Issues of standardization of system management functions - maintenance, administration, network database access - are going to be very difficult to standardize in the near term.

X.500 is another set of standards applicable to the messaging application. It was created to provide a worldwide messaging directory that enables E-mail users to reach other E-mail users worldwide, regardless of the system used. X.500 specifies an on-line directory for message communications allowing network providers to map a common interconnected directory of worldwide users. Most X.500 standards will not reach maturity before the end of 1992, with useful products not available until late in 1993. In the interim, users must rely on vendor proprietary directory services, develop internal capabilities, or rely on third parties. The third party approach may be an attractive alternative for large-scale multi-vendor networks by providing high functionality, multi-vendor interoperability, and moderate cost. The third party approach also provides market entrants with a business opportunity.

Telecommunications Study:
MBE Opportunities

D. Geographic/International Issues

Domestic and international geography are not issues from the standpoints of system availability, application availability, or cost. Voice mail, voice messaging and electronic mail systems can be made available anywhere that basic telephone service and PC-LAN capabilities exist. From a business application and network standpoint, geography is a prime consideration. Messaging systems, both voice and electronic/text, provide a benefit to organizations that conduct business and require communications with locations in different time zones and in different parts of the world. Having the ability to leave a voice or electronic message at any time of day or night allows a business to communicate with another office, location or business partner without having to be available in the middle of the night.

U.S. based companies, with overseas locations, have begun to extend their systems to international offices and facilities. Voice messaging penetration, in Europe as an example, is far more limited than in the U.S. The lower availability of touch tone telephones is one inhibitor. It is interesting to note, however, that the majority of commercial installations in Europe require a smaller, cheaper, entry level system to work with the smaller, private telephone exchanges installed overseas. It remains to be seen whether the European culture is ready for the degree of automation that leading voice messaging vendors provide today in the U.S.

The need for voice or data network standards is a major consideration for companies that use voice processing or electronic mail. This takes several layers of network into consideration.

1. LANs or voice systems within a building
2. Voice network and telephone exchanges for inter-location voice processing systems
3. LAN and wide-area networking interconnection for handling multiple locations for electronic mail

The networking requirement is one of the major factors driving the need for protocol standards discussed in section C "Constraints".

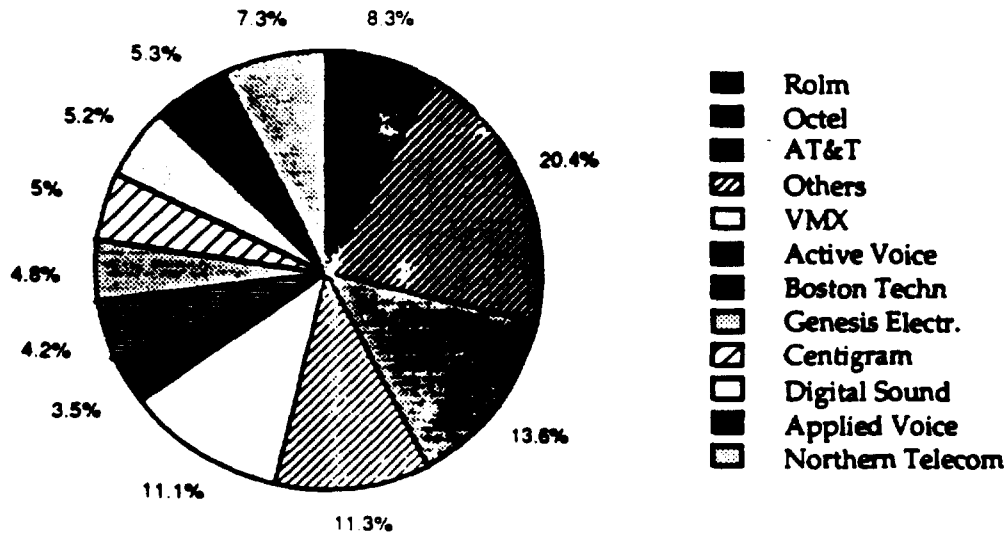
E. Market Players

The voice processing and electronic messaging markets are comprised of a diverse set of companies. In each market segment, there are a number of key players and market drivers from a product and application perspective. In addition, this market still provides

Telecommunications Study:
MBE Opportunities

an opportunity for smaller players to find a viable niche. Within the voice messaging market Octel, AT&T and VMX are the leading providers. The following figure provides a view of the market share leaders and major providers of voice messaging systems and functionality.

Figure 6
1990 Voice Messaging Market Share



Source Gartner Group

1. AT&T Business Communications Systems - They offer both a network-based and premises-based solution. The network-based version of voice mail requires a standard one-year contract at a monthly fee of between \$8 and \$12. The premise-based system enables users to customize the application. The premises system can be integrated into a large PBX. Standard features include audiotext, automated attendant, priority message delivery, and sender message edition. Interactive voice response is not yet available. Future applications include facsimile.
2. Converse Technology - has the most complete set of totally integrated applications including E-mail, voice messaging, call processing, and fax store and forward.

Telecommunications Study:
MBE Opportunities

3. Centigram Corp - Centigram targets larger corporations and telephone companies. Centigram has a joint marketing relationship with Northern Telecom. Standard features include audiotext, directory service, priority message delivery, and sender message editing. Automated attendant and interactive voice response are optional features.
4. Digital Sound Corporation - Digital sells products as turnkey systems to large and medium-sized companies. Current applications include automated attendant, audiotext, interactive voice response, speech synthesis and speech recognition.
5. Northern Telecom - Northern Telecom uses a premise-based solution integrated with their PBX. The system is sold through Northern Telecom's direct sales office and through a marketing relationship Northern Telecom has with each of the Regional Bell Operating Companies. Standard features of the system include directory service, priority message delivery, and sender message editing. Optional features include audiotext, automated attendant, and interactive voice response.
6. Octel Communications Corp - Octel has been the market leader in the premise-based market. Octel's strength rests in the large number of central office installations and strong distribution channels with the RBOCs. Standard features include automated attendant, directory service, priority message delivery, and sender message editing. Audiotext is optional.
7. Rolm - Rolm has over 2800 systems installed. They are jointly owned by IBM and Siemens. Rolm's systems are integrated with either a PBX or Centrex system. Fifty percent of Rolm PBXs are installed with voice messaging. Standard applications include auto attendant, audiotext, priority message delivery, voice response, voice store and forward, and fax.
8. VMX - VMX pioneered the voice messaging industry. It holds the patent for voice messaging in the U.S. and has over 4000 systems installed. VMX holds a strong position in the market for very large systems. It also operates its own service bureau. Configurations also include stand-alone and PBX or Centrex integration. Standard features include audiotext, priority message delivery, and sender message editing. Optional features include